Prof. Mackenzie is an idealist in his general position, though he evidently realises the difficulties which beset an over-hasty idealism, and states his result in an avowedly tentative form. A. E. T.

Histoire des Mathématiques dans l'Antiquité et le Moyen Age. Par H. G. Zeuthen. Traduite par J. Mascart. Pp. xvi + 296. (Paris: Gauthier-Villars, 1902). Price fr. 7.

This translation of Prof. Zeuthen's well-known and deservedly popular work has been revised by the author, and several interesting notes have been added by M. Paul Tannery. The greater part of the volume deals with the mathematics of the Greeks, especially their geometry; the Elements of Euclid, in particular, are analysed in considerable detail, and discussed with intelligence and sympathy. Conservatives who still rally to the cry of "Euclid, and nothing but Euclid," may be respectfully invited to study, with the help of such comments as Prof. Zeuthen's, the actual text of the Elements, which is now easily procurable in Heiberg's excellent edition. It ought, on the one hand, to increase their admiration of the Greek geometer, and, on the other, to convince them of the absurdity of supposing that a garbled travesty of a portion of his work is the best introduction to geometry to put into the hands of the English schoolboy. Another interesting section is that which deals with the mathematics of the Arabs. It is difficult to claim for them any very substantial contributions to the science; but they showed themselves apt pupils both of the Greeks and of the Indians, they kept the study of mathematics alive when Christian Europe was passing through its darkest age of ignorance and superstition, and they powerfully helped on the subsequent revival. To Moslem scholars, and their enlightened rulers, modern Europe owes a debt which is not always sufficiently realised. M.

A la Conquête du Ciel! Contributions Astronomiques de F. C. de Nascius, en Quinze Livres. Livre Deuxième (fascicule 6 et dernier.) Pp. 84. (Nantes: Imprimerie-Libraire, Guist'hau, 1902.)

M. F. C. de Nascius has favoured us from time to time with copies of his astronomical contributions, which are to extend when complete to fifteen volumes. Since each volume consists of numerous parts, it will be easily understood that no inconsiderable task awaits the reader who aspires to a complete mastery of the author's methods and teaching. Only one small part of the second volume lies before us, but we confess that we are utterly unable to comprehend its purpose or to do justice to the ingenuity that apparently underlies its construction. The general conception seems to be remotely connected with Bode's law, but is far more difficult of apprehension, for with this is connected a discussion of the "triangle of divine harmony," while over the whole hovers a bewildering but awe-inspiring theme which is expressed as algorithmic. It will, perhaps, be sufficient to say that the object of the author, if object he has, is by some simple manipulation of figures to produce quantities that shall approximate to various astronomical constants, such as the periods and distances of the planets. For example, he sets out to establish or reproduce the period of sunspots, which he gives at 11·11 years. The triangle of divine harmony is, we are assured, admirably adapted for this species of discussion. This triangle happens, fortunately, to be right-angled, and two sides have the values 69 and 17·89. There is a good deal about the number 69, which we are very solemnly assured is equal to 64 + 5, and it is no doubt entirely one's own fault if he fails to correctly apprehend its true significance, but 17·89 seems to be introduced here for the first time, at least in this volume, and one may be excused if he fails to perceive its actual bearing. Our author handles these quantities in the following way. The area of the divine triangle is first found, this is then doubled to get a parallelogram, and the side of a square found the area of which is equal to the tenth part of that parallelogram. This side has for its numerical value 11·110! and the author congratulates himself on his success.

For many years, we are afraid, M. de Nascius has laboured on similar lines, which are destined to bring him or his readers little profit, but which he will no doubt pursue so long as he can trace his figures. It is nearly thirty years, he tells us, since he first placed a hesitating foot on the path which was destined to lead him to such brilliant discoveries. Let us hope that he has been frequently cheered by finding some close coincidence between his calculations and observed facts, and that his delight has been as keen as that experienced by other physicists who have trod a more legitimate road and been led to more valuable results.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

Mr. Marconi's Results in Day and Night Wireless Telegraphy.

Reading a brief account of these results in the *Times* of June 14, I perceive that Signor Marconi advances in explanation of the greater distance at which night signals were received, that the day signalling is affected by diselectrification of the transmitting elevated conductor.

If—as I gather—Signor Marconi is referring to his observations made at positions in the Atlantic, west of England, the waves travelling westward, may not æther drift in the earth's orbital path be concerned in producing the effects observed?

The waves advancing against the orbital æther stream in the day time, with it at night, might be supposed to give rise to conditions analogous to those which affect the transmissibility of sound against or with a high wind. It will assist if we assume a retarded æther drift near the earth's surface and free motion above. But still, the difficulty in this explanation resides in the very great magnitude of the effects observed.

I write merely by way of suggestion, and in very considerable ignorance of almost every particular involved in this explanation.

J. Joly.

Geological Laboratory, Trinity College, Dublin, June 17.

Remarkable Sunsets at Madeira.

The last few evenings we have witnessed here some beautiful sunsets, closely resembling the sunsets observed after the Krakatoa eruption, which I remember well, *i.e.* there is the same large area of beautiful pink haze in the west and high up in the sky at and immediately after sunset. The first sunset which I felt certain was of the above character I noticed on Friday, June 6. On June 10 and yesterday the display was particularly striking. There were indications, I believe, of the pink glow on one or two evenings before June 6, but as there were a good many clouds about it was difficult to feel certain of the special character of the sunsets. F. W. T. Krohn.

Funchal, Madeira, June 12.

THE INSTITUTION OF ELECTRICAL ENGINEERS' DEPUTATION ON ELECTRICAL LEGISLATION.

We published an article a short time ago (Nature, vol. lxvi. p. 35) on the report of the committee appointed by the Institution of Electrical Engineers to inquire into the cause of this country's backwardness in electrical industries, and stated that it had been decided to ask the Prime Minister to receive a deputation on the subject. This deputation, after being once or twice postponed, waited upon the President of the Board of Trade, the Right Hon. Gerald W. Balfour, M.P., on

Tuesday, June 17. A number of influential members of the Institution were present, including Mr. J. Swinburne (president), Lord Kelvin, Prof. J. Perry, Prof. S. P. Thompson, Colonel R. E. Crompton and Mr. S. Z. de Ferranti.

Lord Kelvin having introduced the deputation, Mr. Swinburne gave a clear statement of the case. He pointed out that local authorities had become involved in electrical enterprise through what was in reality only an accident, namely, that the laying of mains involved opening up the streets. As a result they had obtained legal powers which were not always used properly or in the interests of the community. Even a municipality acting in the true interests of its own ratepayers need not necessarily be doing what was best for the country at large. It was, moreover, now possible to carry out electrical undertakings on a scale that was not contemplated when the Acts by which they are governed (the Electric Lighting Acts of 1882–1888 and the Tramways Act of 1870) were passed. They urged, therefore, that the whole question of electrical legislation should be reconsidered by the Government with special reference to the right and advisability of allowing the municipalities to retain their present powers. This question concerned the Government as a whole, but there was also a matter concerning the Board of Trade in particular. It was thought that there should be a larger electrical staff to enable the Board of Trade to deal more satisfactorily with modern developments. Many of the regulations were behindhand, and it was thought desirable that some questions, such as the use of overhead wires, the size of transformers, &c., should be reopened.

Other speakers followed, including Colonel Crompton, who cited the case of Hove as one in which the Corporation had done its best to thwart the efforts of the company which was supplying electric light. Mr. Ferranti laid stress on the desirability of allowing the use of overheadwires so that the capital expenditure of pioneering schemes might be diminished, and urged greater flexibility in the Board of Trade regulations generally. It was finally agreed that the Institution of Electrical Engineers should go through the regulations and make recommendations to the Board of Trade on the points which electricians consider require amendment.

Mr. Gerald Balfour, in replying on the main question, admitted England's backwardness, but doubted whether it was entirely, or even chiefly, due to the cause alleged. We had to contend in England with the conservatism of strongly developed interests. He did not question, however, that the existing legislation was capable of amendment, and two Bills had already been drafted, one dealing with electric traction and the other with electric lighting. The Traction Bill was to give effect to the recommendations of the departmental committee appointed by the Board of Trade, and he hoped it would prove a satisfactory compromise between the wishes of promoters and municipalities. The Lighting Bill was based on the recommendations of the House of Commons Committee of 1898, which advised considerable modifications of the existing laws. He could not, however, hold out any hope of either Bill being passed this session. Mr. Swinburne asked that the whole question might be considered by a Royal Commission, and Mr. Balfour replied that he would be willing to consult the Cabinet, but could not say, without further consideration, whether he should recommend the suggestion to be adopted.

It need scarcely be said that this promise is quite insufficient to satisfy the urgency of the case. Indeed, the spirit of the reply to the deputation is not what should inspire statesmen who desire to encourage national progress. It is conceded that the obstacles to electrical development in this country are serious, and that they prevent our electrical engineers from keeping the nation in the forefront of progress. The obvious duty of an enlightened Government is to insist that difficulties in the way of industrial advances must be removed; or, at any rate, encouragement should be given to those who have to overcome them. Instead of this, our statesmen find excuses for the barriers across the road, and are eager to show reason why no attempt should be made to break them down.

Such justification as Mr. Gerald Balfour gave for masterly inactivity is almost sufficient to make anyone abandon hope that departmental officials will ever understand the needs of science and technical industries. What do they know of progress whose only desire is not to interfere with vested interests? Any advances that are made in England are due to the restless men who have in them the spirit of evolution and who force development in spite of unsympathetic circumstances. But we cannot hope to keep in line with other progressive nations unless the conditions for improvement are made more favourable. In commenting upon the apathetic spirit in which Mr. Gerald Balfour met the deputation, the *Times* referred to our leeway in electrical industries and expressed the views of many thoughtful men as to the need of making it up. The remarks are worth reproduction here, because they show that the position taken by the Government is one from which the interests of science and industry cannot be seen.

> It is not merely by America that we have been completely beaten in electrical engineering. We are far behind continental countries as old as ourselves and having quite as many vested interests to deal with. The reason is that every continental Government keeps in touch with the best knowledge of the day, and habitually consults, upon every question involving the application of science, the highest scientific authorities it can find. Had the Government of this country learned to take that course the position of the nation at this moment would be incalculably better than it is. When it was suggested to Mr. Gerald Balfour that his Board of Trade electrical staff is not adequate for the duties thrown upon it, he was apparently unable to grasp the meaning of the criticism. What is meant is that, instead of relying upon inspectors who from the nature of the case were not originally the foremost men in electrical engineering, and who, again from the nature of the case, are not the men most abreast of the developments achieved since their appointment, the Board of Trade should be guided by the advice of the real experts and pioneers who are actually doing the things which its official experts can only criticise from their bureaucratically narrow standpoint.
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> This nation really has no chance in modern conditions unless official persons generally consent to recognise that there are a great many important subjects about which they know nothing, and which are in a state of such rapid change and development that no student, of the calibre which an official salary will attract, can possibly be and remain in a position to legislate about them. What we want is that the real practical and scientific intellect of the country should be called to the aid of the politicians and their official "experts." It is not by Boards of Trade, with their self-sufficiency, their timidity and their necessary ignorance of the later phases of development, that other nations have adapted their legislation to the progress of science. It is by giving intellect that advisory place in the framing of legislation which it will never seek by the politician's method of appealing to the ballot-box. The electrical, chemical, physical and biological questions, upon the solution of which so much modern progress and prosperity depend, deserve and demand the habitual consultation of the best men engaged in their study.

Men of science and leaders of industrial development are familiar with these opinions, and it is time that our statesmen regarded national needs from the same point of view. Unless this is realised the nation cannot hold its position in the industrial wars of the world. The Duke of Devonshire's Commission many years ago gave a warning that continued neglect of scientific and technical interests by the Government must lead to disaster, and we have persistently called for reform to prevent the loss that must come unless the views of our political leaders undergo a complete change. If the awakening does not come soon, the task of making up for the years of forced inaction will be almost impossible to accomplish.

From what has been said it will be seen that no definite hope can be given of an immediately beneficial result accruing from the deputation. It serves, however, to bring the matter somewhat prominently to the notice of the Government and of the general public, and if it accomplishes nothing more it will in this have paved the way for future reform. It is desirable that the public should be educated to know the advantages which electrical engineers are ready and anxious to confer upon them, and why it is that these have not yet been bestowed. Thirteen years ago Prof. Ayrton, in his oft-quoted Sheffield address, predicted that a time was coming when the Sheffield grinder would work amidst beautiful surroundings, deriving the power he needed from a small electrically driven motor. The time is now ripe for the realisation of that prophecy; in some few places, indeed, it is already begun, but for its free and rapid development there are many abuses and much restrictive legislation which must be removed. For electrical distribution the days of the small station supplying a limited area are numbered, and with them the days of effective municipal control. So also with electric traction; wide-spreading tramways connecting town with town and running far out into the country districts are needed to bring about decentralisation and to help to solve the pressing problem of overcrowding. We can hardly expect the municipalities to effect these changes; the arbitrary boundaries of the areas they control have no reference to the suitability of these areas as units for electrical distribution, and their interests are, moreover, to a certain degree directly opposed to decentralisation. Thus, quite apart from any considerations of the purity of the management or efficiency of municipal electrical undertakings, it will be seen that there is good reason in many cases for looking for better results to the nation from company working. In the train of developments such as would follow the removal of restrictive legislation, we may hope to find the improvement of our position as manufacturers of electrical machinery. The country lacks neither opportunities nor electrical engineers capable of making use of them. We may therefore reasonably look to the development of electrical undertakings to confer a double benefit upon the country; directly, by increasing the comfort and health of the people, and by facilitating commercial work of all kinds; and indirectly by increasing the number and size of electrical factories, and so contributing to the wealth and prosperity of the nation and helping it in the struggle with foreign competitors.

REPORT ON THE TEACHING OF GEOMETRY.

THE immediate result of Prof. Perry's Glasgow address has been the appointment of two committees, the work of which is now near to completion. The British Association committee has, we believe, concerned itself with the more general aspects of the problem. The committee of the Mathematical Association, largely composed of schoolmasters, is formulating a set of detailed recommendations, of which the geometry section was published in the May number of the *Mathematical Gazette* (George Bell and Sons).

The Mathematical Association committee contains delegates from the chief public schools within easy reach of London; it has, therefore, something of a representative character. Its recommendations are very definite; as the editor of the *Gazette* remarks, "it is very desirable that mathematical masters and others should fully avail themselves of this opportunity of placing on record their views as to the proposed changes." The secretary of the committee, Mr. A. W. Siddons, Harrow School, Middlesex, will be glad to receive criticisms of the report.

The study of formal geometry is to be preceded by a substantial introductory course, in which the subject-matter of geometry is to be treated experimentally and inductively. The pupil is to be carefully trained in the use of simple mathematical instruments; he is to be allowed to convince himself of the truth of geometrical theorems by numerical measurements and calculations. In this way he will make his first acquaintance with the main facts of geometry. When he has thus gained familiarity with the subject-matter, he will be in a position to apply the machinery of logic to his knowledge; he will be able to enter, with his eyes open, upon the task of consolidating into a consistent whole the facts he knows. Throughout his whole course he is to treat problems of construction in a practical way; he is not to be content with describing how the thing is done, he is to do it.

Passing to the formal study of geometry, Euclid, or rather a skeleton Euclid, is to be retained as a framework. Large omissions are recommended, but the logical order is to stand.

Theorems are cut loose from the limitations of construction by the admission of "hypothetical constructions." For example, the *pons asinorum* may be proved by bisecting the vertical angle, and thus dividing the isosceles triangle into two triangles that can be shown to be congruent by Prop. 4. For it is obvious that an angle has a bisector, even though the method of constructing it with ruler and compass may appear later in Euclid; the bisector might be found equally well by folding the triangle in two.

Constructions are to be taken out of the formal course and treated in whatever order seems advisable. It is clearly absurd to keep to Euclid's order of constructions unless we are confined to the use of his instruments, an ungraduated ruler and a pair of compasses that cannot be trusted to transfer a distance.

The following order is recommended in teaching the *theorems* of the first three books:—Book i., Book iii. to 32 inclusive, Book ii., Book iii. 35 to the end.

The course is to be lightened by the omission of a considerable number of dull and obvious propositions, such propositions being found more especially in Book iii. Definitions are not to be taught *en bloc* at the beginning of each book, but are to make their appearance only when needed.

It is suggested that two locus propositions should be added to Book i.—the locus of points equidistant from two points, and the locus of points equidistant from two lines. This will enable the pupil to inscribe and circumscribe circles to triangles at an early stage.

Playfair's axiom is preferred to Euclid's; and illustration by rotation is recommended in dealing with angles connected with parallel lines, triangles and polygons.

After Book i. we are to pass to Book iii., which by the omission of Props. 2, 4, 5, 6, 10, 11, 12, 13, 18, 19, 23, 24 is reduced to very modest dimensions. To cover the ground of the omitted propositions there is to be a preliminary discussion of the symmetry of the circle about a diameter, which can be managed experimentally by folding the circle and pricking holes round the semi-circumference.

The "limit" definition of the tangent is allowed; and Euclid's three propositions 16, 18, 19 are condensed into one—"The tangent at any point of a circle, and the radius to the point of contact are at right angles to one another."

Book ii. is to be illustrated by algebra; and in order to simplify the geometrical proofs a rectangle is to be defined as a parallelogram with one of its angles a right angle. The use of the signs + and − is sanctioned.